

WHAT IS CLAIMED IS:

1. A system for filling sample chambers with liquid, comprising:  
a substrate defining the sample chambers and having a fill port, and a network of passageways connecting the sample chambers to the fill port;  
a substrate support to retain the substrate in a fill position;  
a valve module on the substrate support, the valve module having a fill port seal opening to connect with the fill port of the substrate in the fill position, and a vacuum opening for connection to a source of vacuum, and further including a valve body having a liquid outlet port and a vacuum port; and  
means for operating the valve body so that the liquid outlet port and the vacuum port are alternately in fluid communication with the fill port seal opening.
2. The system of claim 1, wherein the valve body comprises a cylindrical body rotatable in a bore of the valve module.
3. The system of claim 2, wherein the top portion of the cylindrical body defines a reservoir for the liquid, the reservoir being isolated from fluid communication with the vacuum port.
4. The system of claim 3 including priming means for venting gas from the liquid at the liquid outlet port.
5. The system of claim 4, wherein the priming means comprises a divergence of the bore of the valve module and the cylindrical body upwardly from a minor portion of the liquid outlet port.
6. The system of claim 4, wherein the priming means comprises a surface groove in the bore of the housing component that communicates with the liquid

outlet port when the vacuum port is in fluid communication with the fill port seal opening.

7. The system of claim 1, wherein the substrate includes at least two groups of the sample chambers, a fill port for each of the at least two groups, and at least two networks of passageways connecting the at least two groups of sample chambers to the respective fill ports, and wherein the valve module includes at least two fill port seal openings associated respectively with the at least two fill ports, and at least two valve bodies each having a liquid outlet port and a vacuum port.

8. The system of claim 7, comprising means for simultaneously actuating the at least two valve bodies.

9. The system of claim 8, wherein the means for simultaneously actuating the at least two valve bodies comprises a reciprocal comb member having tooth-like valve handle engaging projections exceeding the number of valve bodies by one.

10. A system for filling sample chambers with liquid samples and/or liquid reagents, comprising:

a substrate defining at least two groups of the sample chambers, a fill port for each of the at least two groups, and at least two networks of passageways connecting the at least two groups of sample chambers to the respective fill ports;

at least two valve members associated respectively with the fill ports, each valve member including a housing component having a fill port seal opening and a vacuum opening for connection to a source of vacuum, and a valve body having a liquid outlet port and a vacuum port; and

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means for operating the at least two valve members so that the respective liquid outlet port and the vacuum port of each valve body is alternately in fluid communication with the fill port seal opening thereof.

11. The system of claim 10, wherein the housing components of the at least two valve members are integrated in a common valve housing.

12. The system of claim 11, wherein the common valve housing has front and back sides, the fill port seal openings for the at least two valve members being aligned on the front side of the common valve housing, and the vacuum port openings being accessible at the back side of the common valve housing.

13. The system of claim 12 including means for clamping the substrate against the front side of the common valve housing so that the fill ports for the at least two groups of sample chambers are aligned with and sealed against the fill port seal openings of the respective valve members.

14. The system of claim 10, wherein the valve body of the at least two valve members comprises a cylindrical body rotatable in the respective housing component, the vacuum port being defined by a diametric hole through the cylindrical body.

15. The system of claim 14, wherein the top portion of the cylindrical body defines a reservoir for the liquid samples and/or liquid reagents.

16. The system of claim 15, wherein the liquid outlet port extends radially from the reservoir to a peripheral surface of the cylindrical body and is angularly spaced from the diametric hole.

17. The system of claim 15, wherein the means for operating the at least two valve members comprises a radial handle on the cylindrical body of each of the valve members, and angularly spaced stops for positioning either of the vacuum port or the liquid outlet port in fluid communication with the respective fill port seal opening.

18. A system for filling a substrate containing sample chambers with liquid, comprising:

a substrate support to retain the substrate in a fill position;

a valve module on the substrate support, the valve module having a fill port seal opening to connect with the fill port of the substrate in the fill position, and a vacuum opening for connection to a source of vacuum, and further including a valve body having a liquid outlet port and a vacuum port;

means for operating the valve body so that the liquid outlet port and the vacuum port are alternately in fluid communication with the fill port seal opening; and

priming means for venting gas from the liquid at the liquid outlet port.

19. The system of claim 18, wherein the valve body comprises a cylindrical body rotatable in a bore of the valve module.

20. The system of claim 19, wherein the top portion of the cylindrical body defines a reservoir for the liquid, the reservoir being isolated from fluid communication with the vacuum port.

21. The system of claim 18, wherein the priming means comprises a divergence of the bore of the valve module and the cylindrical body upwardly from a minor portion of the liquid outlet port.

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22. The system of claim 18, wherein the priming means comprises a surface groove in the bore of the housing component that communicates with the liquid outlet port when the vacuum port is in fluid communication with the fill port seal opening.

23. The system of claim 18, wherein the valve module includes at least two fill port seal openings, and at least two valve bodies each having a liquid outlet port and a vacuum port.

24. A system for filling a substrate containing sample chambers with liquid, comprising:

a substrate support to retain the substrate in a fill position;

a valve module on the substrate support, the valve module having a fill port seal opening to connect with the fill port of the substrate in the fill position, a vacuum opening for connection to a source of vacuum, and a valve body having a reservoir for the liquid, a liquid outlet for connecting the reservoir to the fill port seal opening, and a vacuum port; and

means for operating the valve body so that the liquid outlet port and the vacuum port are alternately in fluid communication with the fill port seal opening.

25. The system of claim 24, wherein the reservoir is isolated from fluid communication with the vacuum port.

26. The system of claim 24, further comprising priming means for venting gas from the liquid at the liquid outlet port.

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27. The system of claim 26, wherein the priming means comprises a divergence of the bore of the valve module and the cylindrical body upwardly from a minor portion of the liquid outlet port.

28. The system of claim 26, wherein the priming means comprises a surface groove in the bore of the housing component that communicates with the liquid outlet port when the vacuum port is in fluid communication with the fill port seal opening.

29. The system of any one of claims 1, 10, 18, or 24, wherein the fill port seal opening is defined by an elastomeric tip having a central bore and a rearwardly divergent frusto-conical surface.

30. The system of claim 29, wherein the rearwardly divergent frusto-conical surface extends between a central front annulus and a peripheral front annulus.

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